PATENT ABSTRACTS OF JAPAN

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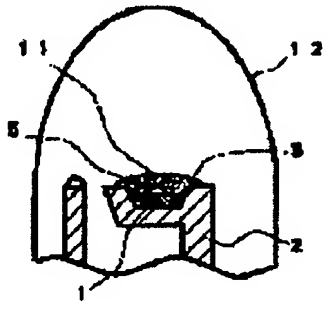
(54) LIGHT EMITTING DIODE

(57)Abstract:
PURPOSE: To provide a LED capable of avoiding color mixture even if the LEDs in different wavelength are closely arranged when a fluorescent pigment is used while the focussing of converted and emitted light is enhanced for increasing the brightness of the LED when a wavelength conversion material is contained in a resin of LED for wavelength conversion of light emitting chip.
CONSTITUTION: A sealing resin of LED comprises the first resin 11 filling up the inside of a cup 3 and the second resin 12 encircling the first resin 11 while the first resin 11 contains the fluorescent material converting the light emitting wavelength of a light emitting chip to the other wavelength or a wavelength converting material 5 such as a filter material, etc., partly absorbing the light emitting wavelength thereby increasing the brightness, focussing efficiency due to the wavelength conversion light reflected on the cup 3.



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[Date of extinction of right]	

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CLAIMS

[Claim(s)]
[Claim 1] The first resin with which it is the light emitting diode which comes to close the whole light emitting device by which the luminescence chip was laid in the pars basilaris ossis occipitalis of the cup which reflects luminescence of a luminescence chip in a luminescence observation side side by resin, and said resin is filled up with said interior of a cup, Light emitting diode which consists of the second resin which surrounds the first resin, and is characterized by the fluorescent material which changes the luminescence wavelength of a luminescence chip into other wavelength, or the filter matter which absorbs a part of luminescence wavelength of a luminescence chip containing to said first resin.
[Claim 2] It is the light emitting diode according to claim 1 characterized by for the matter contained in the resin of said first resin being a fluorescent material, and filling up with said first resin so that it may become lower than the horizontal plane of the edge of said cup.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to LED which changes or absorbs a part of luminescence of a luminescence chip on wavelength which is applied to light emitting diode (it is called Following LED.), especially is different in the luminescence wavelength of a luminescence chip.
[0002]
[Description of the Prior Art] Drawing 2 is the type section Fig. showing one structure of the conventional LED, and the cup prepared in order for the luminescence chip with which 1 consists of a compound semiconductor, and 2 to reflect luminescence of a luminescence chip in a leadframe and to reflect 3 in a luminescence observation side side, and 4 are resin which closes the whole light emitting device. Usually, although highly transparent resin is chosen in order for resin 4 to emit luminescence of a luminescence chip efficiently into air The fluorescent material which changes luminescence of a luminescence chip into other wavelength into the resin 4 in order to be the purpose which changes the luminescent color of the luminescence chip into others or to amend a color, or filter matter 5 (it is hereafter called the wavelength conversion ingredient 5.) which absorbs a part of luminescence wavelength of luminescence wavelength It may be mixed. In this case, usually it is mixed so that the wavelength conversion ingredient 5 may be distributed to resin 4 at homogeneity.
[0003]
[Problem(s) to be Solved by the Invention] However, when homogeneity is made to distribute the wavelength conversion ingredient 5 in resin 4 for the above-mentioned purpose, as shown in this drawing, the light by which wavelength conversion was carried out, or the light into which unnecessary wavelength was cut are scattered about in all directions in resin 4, and have the problem that condensing worsens. The arrow head of drawing 2 is drawing having shown typically signs that the light by which wavelength conversion of the light of a luminescence chip was carried out in the wavelength conversion ingredient 5 was scattered about. That is, when the light by which wavelength conversion was carried out is scattered about, the quantity of light by the side of a luminescence observation side decreases, and brightness becomes low.
[0004] Moreover, when the wavelength conversion ingredient 5 is limited to a fluorescent material, it approaches and LED of the different luminescent color is installed as a new trouble, there is a problem of excessive luminescence of the fluorescent material by other LED luminescence. For example, green LED containing the fluorescent material from which green luminescence is obtained with a blue luminescence chip, If green LED is switched off and blue LED is turned on when it approaches horizontally on the same flat surface and blue LED which consists only of a mere blue luminescence chip is put in order, by the light which leaks and comes out of blue LED, i.e., the scattered-about light The fluorescent material of green LED is excited, it will be in the condition that green LED which put out the light lit up, and the color mixture of both LED will occur.
[0005] Therefore, the place made into the purpose of this invention sets it as another purpose to offer LED to which color mixture does not happen even if it approaches and installs LED from which wavelength differs, when a fluorescent pigment is used [and] for the purpose of improving condensing of luminescence changed first and raising the brightness of LED, in case the resin of LED is made to contain a wavelength conversion ingredient and wavelength conversion of a luminescence chip is performed.
[0006]

[Means for Solving the Problem] The first resin with which LED of this invention is LED which comes to close the whole light emitting device by which the luminescence chip was laid in the pars basilaris ossis occipitalis of the cup which reflects luminescence of a luminescence chip in a luminescence observation side side by resin, and said resin is filled up with said interior of a cup, It consists of the second resin which surrounds the first resin, and is characterized by the fluorescent material which changes the luminescence wavelength of a luminescence chip into said first resin at other wavelength, or the filter matter which absorbs a part of luminescence wavelength of a luminescence chip containing.

[0007]

[Function] LED of this invention absorbs a part of conversion or unnecessary wavelength for luminescence of a luminescence chip on desired wavelength in the first resin. Thus, although the light by which wavelength conversion was carried out is scattered about in all directions, it is reflected by the cup and most scattered light is condensed at a luminescence observation side side.

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TECHNICAL FIELD

[Industrial Application] This invention relates to LED which changes or absorbs a part of luminescence of a luminescence chip on wavelength which is applied to light emitting diode (it is called Following LED.), especially is different in the luminescence wavelength of a luminescence chip.

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PRIOR ART

[Description of the Prior Art] Drawing 2 is the type section Fig. showing one structure of the conventional LED, and the cup prepared in order for the luminescence chip with which 1 consists of a compound semiconductor, and 2 to reflect luminescence of a luminescence chip in a leadframe and to reflect 3 in a luminescence observation side side, and 4 are resin which closes the whole light emitting device. Usually, although highly transparent resin is chosen in order for resin 4 to emit luminescence of a luminescence chip efficiently into air The fluorescent material which changes luminescence of a luminescence chip into other wavelength into the resin 4 in order to be the purpose which changes the luminescent color of the luminescence chip into others or to amend a color, or filter matter 5 (it is hereafter called the wavelength conversion ingredient 5.) which absorbs a part of luminescence wavelength of luminescence wavelength It may be mixed. In this case, usually it is mixed so that the wavelength conversion ingredient 5 may be distributed to resin 4 at homogeneity.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since conversion light reflects inside a cup since LED of this invention has filled up the interior of a cup with the first resin containing a wavelength conversion ingredient as explained above, and it is condensed, brightness improves more than twice. Moreover, when making the cup depth deep and making it the first resin not overflow a cup, and the first resin is made to contain a fluorescent pigment, wavelength conversion is performed and a flat-surface display is realized [the color mixture between LED does not occur, for example,] by LED, an image with very sufficient resolution can be obtained.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, when homogeneity is made to distribute the wavelength conversion ingredient 5 in resin 4 for the above-mentioned purpose, as shown in this drawing, the light by which wavelength conversion was carried out, or the light into which unnecessary wavelength was cut are scattered about in all directions in resin 4, and have the problem that condensing worsens. The arrow head of drawing 2 is drawing having shown typically signs that the light by which wavelength conversion of the light of a luminescence chip was carried out in the wavelength conversion ingredient 5 was scattered about. That is, when the light by which wavelength conversion was carried out is scattered about, the quantity of light by the side of a luminescence observation side decreases, and brightness becomes low.
[0004] Moreover, when the wavelength conversion ingredient 5 is limited to a fluorescent material, it approaches and LED of the different luminescent color is installed as a new trouble, there is a problem of excessive luminescence of the fluorescent material by other LED luminescence. For example, green LED containing the fluorescent material from which green luminescence is obtained with a blue luminescence chip, If green LED is switched off and blue LED is turned on when it approaches horizontally on the same flat surface and blue LED which consists only of a mere blue luminescence chip is put in order, by the light which leaks and comes out of blue LED, i.e., the scattered-about light The fluorescent material of green LED is excited, it will be in the condition that green LED which put out the light lit up, and the color mixture of both LED will occur.
[0005] Therefore, the place made into the purpose of this invention sets it as another purpose to offer LED to which color mixture does not happen even if it approaches and installs LED from which wavelength differs, when a fluorescent pigment is used [and] for the purpose of improving condensing of luminescence changed first and raising the brightness of LED, in case the resin of LED is made to contain a wavelength conversion ingredient and wavelength conversion of a luminescence chip is performed.

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MEANS

[Means for Solving the Problem] The first resin with which LED of this invention is LED which comes to close the whole light emitting device by which the luminescence chip was laid in the pars basilaris ossis occipitalis of the cup which reflects luminescence of a luminescence chip in a luminescence observation side side by resin, and said resin is filled up with said interior of a cup, It consists of the second resin which surrounds the first resin, and is characterized by the fluorescent material which changes the luminescence wavelength of a luminescence chip into said first resin at other wavelength, or the filter matter which absorbs a part of luminescence wavelength of a luminescence chip containing.

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OPERATION

[Function] LED of this invention absorbs a part of conversion or unnecessary wavelength for luminescence of a luminescence chip on desired wavelength in the first resin. Thus, although the light by which wavelength conversion was carried out is scattered about in all directions, it is reflected by the cup and most scattered light is condensed at a luminescence observation side side. that is, since the cup of this application reflects the light by which wavelength conversion was carried out with the wavelength conversion ingredient and can be condensed within the first resin, the condensing effectiveness of conversion light is markedly alike, and improves.
[0008] Furthermore, if it is filled up with the first resin containing a fluorescent material so that it may become lower than the horizontal plane of the edge of a cup when a wavelength conversion ingredient is used as a fluorescent material, when the light which carries out incidence from the outside is interrupted on the edge of a cup and does not reach even a fluorescent material, the color mixture between LED can be prevented. If it says simply, when making it the first resin which makes the cup depth deep and contains a fluorescent material not overflow a cup, the source of excitation of a fluorescent material can be restricted only to the luminescence wavelength of a luminescence chip.

[Translation done.]

JP,07-099345,A [EXAMPLE]

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EXAMPLE

[Example] Drawing 1 is the type section Fig. showing the structure of LED of one example of this application, and is taken as the structure which closed the whole light emitting device which laid the luminescence chip 1 which consists of a compound semiconductor like drawing 2 on the leadframe 2 which has a cup 3 by resin. However, a different place from drawing 2 consists of the first resin 11 with which closure resin is filled up with the cup 3 interior, and the second resin 12 which surrounds the first resin, and conversion or the wavelength conversion ingredient 5 which is absorbed in part and to change contains the luminescence wavelength of a luminescence chip to the first resin 11 at other wavelength.

[0010] The same ingredient is sufficient as the ingredient of the first resin 11 and the second resin, for example, it constitutes both from an epoxy resin, and should just make only the first resin contain a fluorescent material 5 in LED of this invention. Furthermore, a good thing cannot be overemphasized even when the ingredient of the second resin 12 is the same as the resin 4 of drawing 2 . Moreover, as long as the wavelength conversion ingredient 5 is an ingredient which can change the luminescence wavelength of luminescence chips, such as fluorescent dye, a fluorescent pigment, and a fluorescent substance, into other wavelength if it is a fluorescent material, it may use what kind of thing, and if it is the filter matter, the unnecessary wavelength of luminescence of a luminescence chip will be absorbed, the ingredient which improves color purity is chosen, and inorganic [which usually has the same color as the luminescent color of a luminescence chip], and an organic filter pigment are used.

[0011] Although the interior of a cup in which the luminescence chip 1 was beforehand laid in order to usually drive out the air of a cup 3 is pre dipped by resin in an LED production process in order to obtain LED of such structure for example In case it pre dips, the first resin 11 is made to contain the wavelength conversion ingredient 5, and after the first resin 11 containing the wavelength conversion ingredient 5 hardens, it can obtain by closing by the second resin 12.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The type section Fig. showing the structure of 1 LED of this invention.
[Drawing 2] The type section Fig. showing the structure of the conventional LED.
[Drawing 3] The type section Fig. expanding and showing the part of the cup 3 of LED concerning other examples of this invention.
[Drawing 4] The type section Fig. expanding and showing the part of the cup 3 of LED concerning other examples of this invention.
[Description of Notations]
1 ... Luminescence chip 2 ... Leadframe
3 ... Cup 5 ... Wavelength conversion ingredient
11 ... The first resin 12 ... The second resin

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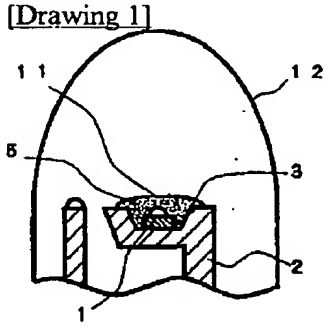
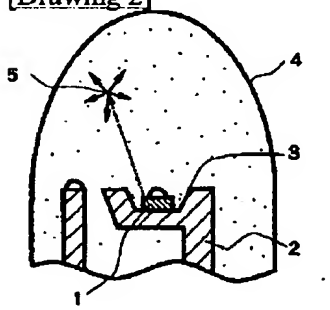
DRAWINGS

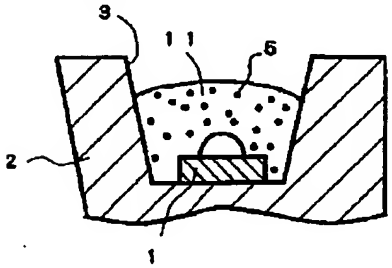
[Drawing 1]



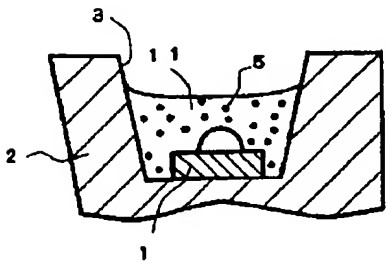
[Drawing 2]



[Drawing 3]



[Drawing 4]



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審査請求 未請求 請求項の数２ ＯＬ （全 ４ 頁） 最終頁に続く

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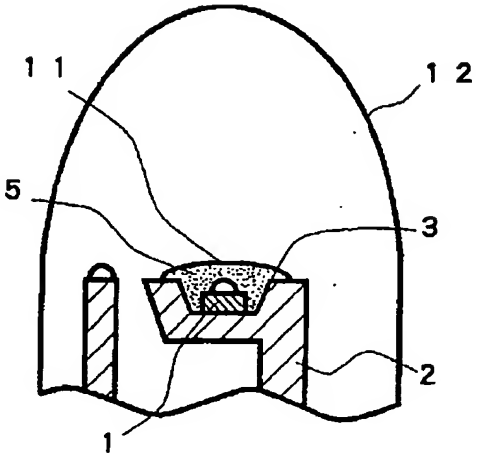
(54)【発明の名称】 発光ダイオード

(57)【要約】

【目的】 ＬＥＤの樹脂に波長変換材料を含有させて発光チップの波長変換を行う際、まず変換された発光の集光をよくしてＬＥＤの輝度を高めることを目的とし、また蛍光顔料を使用した際、波長の異なるＬＥＤを近接して設置しても混色の起こらないＬＥＤを提供する。

【構成】 ＬＥＤの封止樹脂が、カップ３内部を充填する第一の樹脂１１と、その第一の樹脂を包囲する第二の樹脂１２とからなり、第一の樹脂１１には発光チップの発光波長を他の波長に変換する蛍光物質、または発光波長を一部吸収するフィルター物質等の波長変換材料５が含有されていることにより、波長変換光がカップ３に反射されるため輝度、集光効率が向上する。



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【特許請求の範囲】

【請求項1】 発光チップの発光を発光観測面側に反射するカップの底部に発光チップが載置された発光素子全体を、樹脂で封止してなる発光ダイオードであって、前記樹脂は前記カップ内部を充填する第一の樹脂と、その第一の樹脂を包囲する第二の樹脂とからなり、前記第一の樹脂には発光チップの発光波長を他の波長に変換する蛍光物質、または発光チップの発光波長を一部吸収するフィルター物質が含有されていることを特徴とする発光ダイオード。

【請求項2】 前記第一の樹脂の樹脂に含まれる物質が蛍光物質であって、前記第一の樹脂は前記カップの縁部の水平面よりも低くなるように充填されていることを特徴とする請求項1に記載の発光ダイオード。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は発光ダイオード（以下ＬＥＤという。）に係り、特に発光チップの発光波長を異なる波長に変換する、または発光チップの発光を一部吸収するＬＥＤに関する。

【0002】

【従来の技術】図2は従来のＬＥＤの一構造を示す模式断面図であり、1は化合物半導体よりなる発光チップ、2はリードフレーム、3は発光チップの発光を発光観測面側に反射させる目的で設けられたカップ、4は発光素子全体を封止する樹脂である。通常、樹脂4は発光チップの発光を空気中に効率よく放出する目的で透明度の高い樹脂が選択されるが、他にその発光チップの発光色を変換する目的で、あるいは色を補正する目的で、その樹脂4の中に発光チップの発光を他の波長に変換する蛍光物質、または発光波長の発光波長を一部吸収するフィルター物質5（以下、波長変換材料5という。）が混入される場合がある。この場合、波長変換材料5は樹脂4に均一に分散するように混入されるのが通常である。

【0003】

【発明が解決しようとする課題】しかしながら、上記の目的で波長変換材料5を樹脂4中に均一に分散させると、この図に示すように、波長変換された光、または不要な波長がカットされた光は樹脂4中で四方八方に散乱してしまい、集光が悪くなるという問題がある。図2の矢印は発光チップの光が波長変換材料5にあたり、波長変換された光が散乱する様子を模式的に示した図である。つまり、波長変換された光が散乱されることにより、発光観測面側の光量が減少して輝度が低くなるのである。

【0004】また、波長変換材料5を蛍光物質に限定した場合、新たな問題点として、異なる発光色のＬＥＤを接近して設置した際に、他のＬＥＤ発光による蛍光物質のよけいな発光の問題がある。例えば、青色発光チップで緑色発光が得られる蛍光物質を含む緑色ＬＥＤと、単

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なる青色発光チップのみからなる青色ＬＥＤとを同一平面上に水平に近接して並べた場合、緑色ＬＥＤを消灯して、青色ＬＥＤを点灯すると、青色ＬＥＤから洩れ出る光、つまり散乱する光により、緑色ＬＥＤの蛍光物質が励起され、消灯した緑色ＬＥＤがあたかも点灯したような状態となり、両ＬＥＤの混色が発生する。

【0005】従って本発明の目的とするところは、ＬＥＤの樹脂に波長変換材料を含有させて発光チップの波長変換を行う際、まず変換された発光の集光をよくしてＬＥＤの輝度を高めることを目的とし、また蛍光顔料を使用した際、波長の異なるＬＥＤを近接して設置しても混色の起こらないＬＥＤを提供することをもう一つの目的とする。

【0006】

【課題を解決するための手段】本発明のＬＥＤは、発光チップの発光を発光観測面側に反射するカップの底部に発光チップが載置された発光素子全体を、樹脂で封止してなるＬＥＤであって、前記樹脂は前記カップ内部を充填する第一の樹脂と、その第一の樹脂を包囲する第二の樹脂とからなり、前記第一の樹脂には発光チップの発光波長を他の波長に変換する蛍光物質、または発光チップの発光波長を一部吸収するフィルター物質が含有されていることを特徴とする。

【0007】

【作用】本発明のＬＥＤは、発光チップの発光を第一の樹脂内において所望の波長に変換、または不要な波長を一部吸収する。このようにして波長変換された光は四方八方に散乱するが、散乱した光のほとんどはカップにより反射され、発光観測面側に集光される。つまり本願のカップは第一の樹脂内で波長変換材料により波長変換された光を反射して集光できるので、変換光の集光効率が格段に向上する。

【0008】さらに、波長変換材料を蛍光物質とした場合、蛍光物質を含む第一の樹脂をカップの縁部の水平面よりも低くなるように充填すると、外部から入射する光がカップの縁で遮られ、蛍光物質にまで到達しないことにより、ＬＥＤ間の混色を防止することができる。簡単にいうと、カップ深さを深くして蛍光物質を含む第一の樹脂がカップからはみ出さないようにすることにより、蛍光物質の励起源を発光チップの発光波長のみに制限できる。

【0009】

【実施例】図1は本願の一実施例のＬＥＤの構造を示す模式断面図であり、図2と同様に、カップ3を有するリードフレーム2上に化合物半導体よりなる発光チップ1を載置した発光素子全体を、樹脂で封止した構造としている。しかし、図2と異なるところは、封止樹脂がカップ3内部を充填する第一の樹脂11と、その第一の樹脂を包囲する第二の樹脂12とからなり、第一の樹脂11には発光チップの発光波長を他の波長に変換、または一

部吸収する変換する波長変換材料５が含有されている。

【００１０】本発明のＬＥＤにおいて、第一の樹脂１１と第二の樹脂の材料は同一材料でもよく、例えば両方ともエポキシ樹脂で構成し、第一の樹脂にのみ蛍光物質５を含有させればよい。さらに、第二の樹脂１２の材料は図２の樹脂４と同一でもよいことはいうまでもない。また、波長変換材料５は蛍光物質であれば蛍光染料、蛍光顔料、蛍光体等、発光チップの発光波長を他の波長に変換できる材料であればどのようなものを使用してもよく、またフィルター物質であれば発光チップの発光の不要な波長を吸収し、色純度をよくする材料が選択され、通常発光チップの発光色と同一色を有する無機、有機のフィルター顔料が使用される。

【００１１】このような構造のＬＥＤを得るには、例えばＬＥＤ製造工程において、通常カップ３の空気を追い出す目的で、予め発光チップ１を載置したカップ内部を樹脂でプレディップするのであるが、プレディップする際に第一の樹脂１１に波長変換材料５を含有させておき、波長変換材料５を含む第一の樹脂１１が硬化した後、第二の樹脂１２で封止することにより得ることができる。また予め波長変換材料５を含む第一の樹脂１１をカップ３内部に注入してもよい。このようにして、波長変換材料５を含む第一の樹脂１１をカップの３の内部に充填し、第一の樹脂１１で波長変換された光のほとんどがカップ３の反射鏡内に戻り、発光観測面に反射することによりＬＥＤの集光が格段に向上する。

【００１２】また第一の樹脂１１と第二の樹脂１２とを異なる材料とし、第一の樹脂１１、第二の樹脂１２の屈折率を順に小さくして空気の屈折率１に近くなるように設定することにより波長変換された光の外部量子効率が向上する。なおこの場合、第一の樹脂１１の材料には、発光チップ１の屈折率よりも小さい材料を選定することは言うまでもない。

【００１３】図３、および図４は本発明の他の実施例に係るＬＥＤのカップ３の部分を拡大して示す模式断面図であり、図３は第一の樹脂１１の表面が凸状になって硬化してカップ３に充填された状態、図４は逆に凹状となって硬化して充填された状態を示している。いずれの状態においても、波長変換材料５を蛍光物質とした場合、その蛍光物質を含む第一の樹脂１１がカップ３の縁部の水平面よりも低くなるように充填されており、カップ３からはみ出していないので、カップ３の縁部により蛍光物質を励起する外部光を遮断でき、ＬＥＤの混色を防止することができる。

【００１４】

【発明の効果】以上説明したように、本発明のＬＥＤはカップ内部に波長変換材料を含有する第一の樹脂を充填しているため、変換光がカップ内部で反射して集光されるため、輝度は倍以上に向上する。また、蛍光顔料を第一の樹脂に含有させて波長変換を行う場合、カップ深さを深くして、第一の樹脂がカップからはみ出さないようにすることにより、ＬＥＤ間の混色が発生せず、例えばＬＥＤで平面ディスプレイを実現した際には、非常に解像度のよい画像を得ることができる。

【図面の簡単な説明】

【図１】　本発明の一ＬＥＤの構造を示す模式断面図。

【図２】　従来のＬＥＤの構造を示す模式断面図。

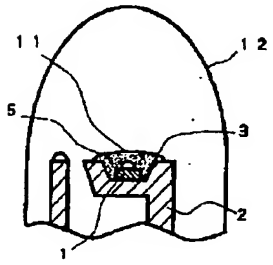
【図３】　本発明の他の実施例に係るＬＥＤのカップ３の部分を拡大して示す模式断面図。

【図４】　本発明の他の実施例に係るＬＥＤのカップ３の部分を拡大して示す模式断面図。

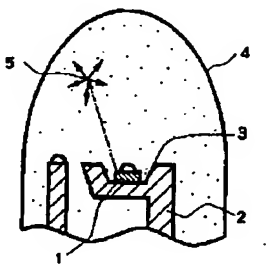
【符号の説明】

１・・・発光チップ　　２・・・リードフレーム
３・・・カップ　　５・・・波長変換材料
１１・・・第一の樹脂　　１２・・・第二の樹脂

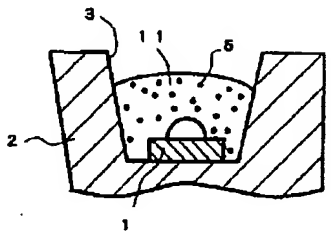
【図１】



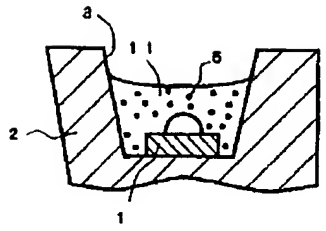
【図２】



【図３】



【図4】



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